CLEAR ROADS
research for winter highway maintenance

RESEARCH BRIEF

FEBRUARY 2025

USING DASHBOARDS TO IMPROVE WINTER OPERATIONS

RESULTS SUMMARY

Best practices and related guidance about data and performance measures will support transportation agency use of dashboards to improve winter maintenance operations.

PROJECT DETAILS

Project Title: Use of Dashboards for Winter Operations

Project Number: CR22-05

Project Cost: $74,477

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Need for Research

Transportation agencies collect vast amounts of data about their winter operations. To use this information productively, many state departments of transportation (DOTs) and other transportation agencies responsible for winter maintenance operations are using dashboards to summarize data and measure performance. These summaries are useful for decision-making during winter weather events and for poststorm reviews to inform future planning. Dashboards are also a valuable mechanism for communicating important winter weather information to both the public and agency leadership.

The specific data gathered and performance measures calculated for dashboards vary by agency based on their operational needs. Though each agency has unique needs, there are innovative and best practices along with lessons learned from agencies already deploying dashboards that could be useful. By better understanding how to develop and implement dashboards, agencies may be able to improve the use of data and information at their disposal to enhance winter maintenance operations.

Objectives and Methodology

The primary goal of this project was to provide state winter maintenance managers with a more complete understanding of dashboard use for tracking and managing information and data that will assist with winter maintenance operations decision-making. The project looked at all aspects of dashboard use, but specifically focused on ways to increase and track level of service, reduce materials use (such as salt) and labor costs, and track overall cost of maintenance operations to identify potential areas for savings.

An expansive literature review examined the current use of dashboards among transportation agencies to assess current strategies and identify innovative and effective practices. A survey of state DOTs and municipalities collected a wide range of information related to dashboard use to identify:

- Number of dashboards within each agency.
- Data inventories and performance measures.
- Methods to link, clean, use and store data.

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Dashboards can assist agencies with winter preparedness and maintenance operations.

- Frequency that dashboards refresh.
- Platforms and databases.
- Planning and processes.

The survey results allowed the research team to identify DOTs that are leading in winter operations dashboards. Interviews and case studies of five state transportation agencies (Iowa, Kentucky, North Dakota, Ohio and Virginia) produced recommendations and best practices for dashboard goals, design, implementation and use. The final report synthesizes lessons learned from this information-gathering effort and will serve as guidance for transportation agencies to better employ winter maintenance operations dashboards.

Results

Survey results indicated that agencies use dashboards to varying degrees. Eighteen of the 23 agencies that responded to the survey (78 percent) use at least one dashboard for winter operations. Of these 18, the number of dashboards used ranged from one (five agencies) to 10 (one agency). According to survey respondents, the performance measures that are most helpful for improving operations are dashboards for weather severity, salt use, automatic vehicle location (AVL) data and road conditions.

Analyses of the findings from the literature review, survey results and case studies resulted in the following best practices and recommendations for implementing or expanding dashboard use:

- Determine what data is available and the audience of the dashboard.
- Document the benefits of a dashboard to offset concerns regarding the cost of development.
- Operate on a suitable platform that allows for high use during winter weather events.
- If switching vendors, understand the effect on data and output. Test and update dashboards, if needed, after a vendor switch.
- Establish a partnership with a university to leverage knowledge and reduce the need for internal resources.
- Use dashboards to track material use, speed and other measures to more effectively allocate resources for winter operations.
- Update dashboards in real time to enable the public and agency leadership to stay abreast of ongoing operations and conditions.
- Incorporate dashboard use in planning, executing and reviewing winter maintenance operations.

Benefits and Implementation

This project provides guidance to transportation agencies that are considering implementing or expanding dashboard use to improve their winter maintenance operations. Agencies can use the results presented in this report to determine which dashboard features and tools would be most beneficial to their operations along with best practices that will help agencies avoid potential pitfalls while implementing and managing the dashboards.

"This project provides agencies with valuable guidance and best practices for establishing or expanding their use of winter operations dashboards to better allocate resources and improve level of service."

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